ENHANCING RENEWABLE ENERGY AWARENESS AND CRITICAL THINKING THROUGH EDP-STEM-PjBL ON HYDROPOWER

RESEARCH PAPER

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Oleh
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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Pendidikan pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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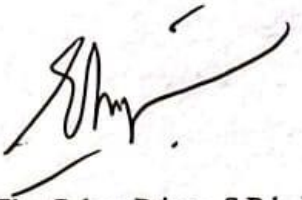

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ENHANCING RENEWABLE ENERGY AWARENESS AND CRITICAL THINKING THROUGH EDP-STEM-PjBL ON HYDROPOWER

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ABSTRACT

This study aims to examine the impact of integrating STEM Project-Based Learning (PjBL) with the Engineering Design Process (EDP) on junior high school students' renewable energy awareness and critical thinking skills. Sixty students participated in a quasi-experimental pre-test post-test design, divided into two groups with 30 students in an experimental class (STEM-PjBL with EDP) and 30 students in the control class (STEM-PjBL without EDP). Both groups are experienced in creating a simple hydropower (water turbine) project. Data were collected using a renewable energy awareness questionnaire, critical thinking essay tests, and student worksheets. The results showed significant improvement in renewable energy awareness in both groups ($p < .001$). Although the N-Gain comparison was not significant ($p = .853$), the experimental class achieved higher post-test scores and improvements across all indicators. Regarding critical thinking skills, both groups showed significant improvement. However, the experimental group demonstrated a much greater overall gain (from 19.37 to 46.00) and better results in all indicators. Student worksheets were analyzed to evaluate project performance. While the direct correlation between students' performances and outcomes was weak, further analysis indicated a strong connection between students' performance and the learning stages. The "Create Schedule" and "Communicate the Results" stages contributed the most. These results suggest that integrating the EDP into STEM-PjBL is an effective method for improving students' renewable energy awareness, critical thinking skills, and engagement.

Keywords: Critical Thinking Skills, Engineering Design Process, Renewable Energy Awareness, STEM Project-Based Learning

MENINGKATKAN KESADARAN ENERGI TERBARUKAN DAN BERPIKIR KRITIS MELALUI *EDP-STEM-PjBL* PADA TENAGA AIR

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ABSTRAK

Penelitian ini bertujuan untuk mengkaji pengaruh integrasi *STEM Project-Based Learning* (PjBL) atau pembelaran berbasis proyek STEM dengan *Engineering Design Process* (EDP) atau proses desain rekayasa terhadap kesadaran energi terbarukan dan keterampilan berpikir kritis siswa SMP. Sebanyak 60 siswa mengikuti desain kuasi-eksperimen dengan pre-test dan post-test, terbagi menjadi dua kelompok, dengan 30 siswa di kelas eksperimen (STEM-PjBL dengan EDP) dan 30 siswa di kelas kontrol (STEM-PjBL tanpa EDP). Kedua kelompok membuat proyek turbin air sederhana sebagai representasi dari pembelajaran energi terbarukan. Instrumen penelitian meliputi kuesioner kesadaran energi, tes esai keterampilan berpikir kritis, dan lembar kerja siswa. Hasil menunjukkan peningkatan signifikan dalam kesadaran energi pada kedua kelas ($p < .001$), meskipun perbandingan N-Gain tidak signifikan ($p = .853$), kelas eksperimen memperoleh skor post-test dan peningkatan indikator yang lebih tinggi. Keterampilan berpikir kritis juga meningkat pada kedua kelas, namun kelas eksperimen menunjukkan peningkatan yang jauh lebih besar (19,37 ke 46,00). Analisis lembar kerja menunjukkan bahwa korelasi langsung dengan hasil belajar tergolong lemah, namun terdapat hubungan kuat antara performa siswa dan tahapan pembelajaran, terutama pada tahap "Membuat Jadwal" dan "Menyampaikan Hasil". Temuan ini mendukung efektivitas EDP dalam STEM-PjBL untuk meningkatkan kesadaran lingkungan, keterampilan berpikir kritis, dan keterlibatan siswa.

Keywords: Kesadaran Energi Terbarukan, Kemampuan Berpikir Kritis, Pembelajaran Berbasis Proyek, Proses Desain Rekayasa

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